

# **EXHIBIT 2**

Excerpts of Deposition of Hal Singer, Ph.D (“Singer 1st Dep.”)  
(September 27, 2017)

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF NEVADA

- - -

IN RE: : Civil Action  
: DOCKET NO.  
CUNG LE, NATHAN QUARRY, : 2:15-cv-01045-RFB-  
JON FITCH, BRANDON VERA, : (PAL)  
LUIS JAVIER VAZQUEZ and :  
KYLE KINGSBURG, on behalf : CLASS ACTION  
of themselves and all :  
others similarly :  
situated, :  
: Plaintiffs, :  
: v. :  
: ZUFFA, LLC, d/b/a :  
ULTIMATE FIGHTING :  
CHAMPIONSHIP and UFC, :  
: Defendants. :

- - -

Wednesday, September 27, 2017

- - -

Videotaped deposition of  
HAL J. SINGER, Ph.D., taken pursuant to  
notice, was held at the law offices of  
Berger & Montague, P.C., 1622 Locust  
Street, Philadelphia, Pennsylvania 19103,  
beginning at 9:24 AM, on the above date,  
before Constance S. Kent, a Certified  
Court Reporter, Registered Professional  
Reporter, Certified LiveNote Reporter, and  
Notary Public in and for the Commonwealth  
of Pennsylvania.

\* \* \*

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1 market definition and which  
2 weighting method I use, right?  
3 That -- that will generate a  
4 foreclosure share that gets spit  
5 out, I think, of a Microsoft Excel  
6 file, and that foreclosure share  
7 is going to be spit out alongside  
8 each observation in the dataset.

9 The regression finds a  
10 relationship between that  
11 foreclosure share and the  
12 fighters' wage share controlling  
13 for all other things and then the  
14 regression is done.

15 At that point, I -- I can  
16 make use of the parameters that  
17 come out of the regression to  
18 project what a fighter's wage  
19 share would be in a but-for world  
20 in which the foreclosure share was  
21 lower.

22 Sorry, I'm being -- I'm  
23 being attacked here by a gnat.  
24 And -- thank you.

1                   And I use three different  
2                   scenarios: Zero percent,  
3                   20 percent and 30 percent.

4           BY MR. ISAACSON:

5                   Q.       Now, when you use a world in  
6                   which there -- Zuffa has zero percent  
7                   foreclosure, how does that translate into  
8                   any -- a market share for Zuffa?

9                   A.       Oh, it could accommodate  
10                  many different market shares for Zuffa.  
11                  It is -- one way of putting it is almost  
12                  agnostic to the market share. It  
13                  could -- it could accommodate many.

14                         You can have -- just to be  
15                  clear, you can have a high market share  
16                  and zero foreclosure share if all of your  
17                  fighters are under, say, 12-month  
18                  contracts.

19                  Q.       And do I understand  
20                  correctly that if all the Zuffa fighters  
21                  were under 12-month contracts, you would  
22                  expect the foreclosure share of Zuffa to  
23                  be zero or close to zero?

24                             MR. CRAMER: Objection to

1 form.

2 THE WITNESS: So I -- I deem  
3 a fighter to be foreclosed, or to  
4 be working or employed pursuant to  
5 an exclusionary contract if, as  
6 you know, the contract is  
7 exclusive and if the duration  
8 exceeds a certain number of  
9 months. I use 30 months I think  
10 as my -- my baseline approach.

11 And so if you -- if you  
12 allow me to use that 30-month  
13 baseline or cutoff as a measure  
14 for whether a fighter is  
15 foreclosed, and if your question  
16 posits that every Zuffa fighter  
17 under contract is -- is at  
18 12 months, then by construction,  
19 12 months is less than 30 months,  
20 and therefore, under that  
21 particular measure of foreclosure,  
22 no fighter would be foreclosed.

23 BY MR. ISAACSON:

24 Q. All right. Is there any --

1 THE WITNESS: Do I  
2 ordinarily do it? I'm sorry, I'm  
3 just not following.

4 BY MR. ISAACSON:

5 Q. How about in standard  
6 economics?

7 MR. CRAMER: Same objection.

8 THE WITNESS: I think that  
9 in standard economics you would  
10 put the wage in the numerator and  
11 you'd put the marginal revenue  
12 product in the denominator.

13 BY MR. ISAACSON:

14 Q. And the marginal revenue  
15 product would be expressed as a dollar  
16 value?

17 A. Yes.

18 Q. And do economists ordinarily  
19 measure the productivity of the  
20 additional output -- well, let me put it  
21 differently.

22 Do economists generally  
23 measure the productivity created when a  
24 firm adds a worker in dollar terms as

1       opposed to as a percentage of revenue?

2                       MR. CRAMER:   Objection to  
3                       form, to generally.   For what  
4                       purpose?

5                       THE WITNESS:   A firm could,  
6                       if a firm bills -- if a law firm  
7                       bills an associate out at \$400 an  
8                       hour, it could express what the --  
9                       what the young lawyer's salary on  
10                      an hourly basis is as a -- under  
11                      an assumed utilization rate as a  
12                      percentage of that young lawyer's  
13                      bill rate.

14       BY MR. ISAACSON:

15                      Q.       And are you aware of any  
16                      studies which express the marginal  
17                      revenue product of labor in terms of the  
18                      percentage of revenue of the firm?

19                      A.       I'm not aware, but as you've  
20                      expressed it, that's not quite what I'm  
21                      doing either.

22                      Q.       Now, in terms of -- did you  
23                      make any effort to measure the marginal  
24                      revenue product of labor of UFC fighters?

1 A. Yes.

2 Q. Okay. And what would you  
3 point to me for that?

4 A. What I did, which is I -- I  
5 calculated the average revenue per event,  
6 per fighter, and I'm using that as a  
7 proxy for the marginal revenue product.

8 Q. All right. If the  
9 average -- when you look at the average  
10 revenue per event, per fighter, how do  
11 you determine what part of that revenue  
12 is the contribution of the fighter as  
13 opposed to, for example, marketing,  
14 promotions, production or the work of the  
15 overall firm?

16 A. So for my purposes, I don't  
17 need to figure out that -- that  
18 decomposition. I will note, however,  
19 that I cite a study in my literature  
20 review section that suggests that the  
21 fighter is responsible for, if not all,  
22 the vast majority of -- of the  
23 pay-per-view revenues that are captured  
24 and not the brand.



1 Q. Well, I didn't ask about the  
2 brand.

3 The -- you would agree --  
4 you would agree with me that effective  
5 marketing and promotion could increase  
6 the average revenue per event, correct?

7 A. Yes.

8 Q. And you would agree with me  
9 that super- -- improving television  
10 production can increase the average  
11 revenue per event?

12 MR. CRAMER: All things  
13 equal?

14 MR. ISAACSON: Yes.

15 THE WITNESS: I'm not sure  
16 what -- what you mean by improving  
17 television production.

18 BY MR. ISAACSON:

19 Q. A better production that  
20 people enjoy more.

21 MR. CRAMER: Objection to  
22 form.

23 THE WITNESS: And you're  
24 asking me if I can conceive of

1       opposed to number 1 is worth something  
2       more than number 15.

3               A.       Right. So the basis is the  
4       record evidence in the case. The record  
5       evidence tells us that the purpose of  
6       the -- of the exclusionary arrangements  
7       is to tie up the most valuable fighter so  
8       as to prevent rivals from getting a  
9       foothold.

10               So that tells me  
11       qualitatively that it's more valuable to  
12       have 1 through 15 sewn up than, say, 75  
13       through 90.

14               Now the question is, how can  
15       I, as an economist, quantify that -- that  
16       difference in valuation, and I've tried  
17       revenue weighting, I've tried rank  
18       weighting and inverse rank weighting and  
19       I've tried unweighted. And at the end of  
20       the day, my -- my basic regression model  
21       is not sensitive to how -- how one does  
22       the weighting.

23               Q.       I'm just focusing now on  
24       your inverse ranking analysis. And I

1 understand that you concluded the number  
2 1 fighter, for example, is more valuable  
3 than the number 10 ranked fighter, but  
4 what's the basis for quantifying that as  
5 the number 1 fighter is ten times more --  
6 worth ten times more than the number 10  
7 fighter?

8 A. I think there is record  
9 evidence suggesting that it would be  
10 sufficient to lock up only the headliners  
11 in order to -- to cripple or to slow the  
12 advance of a rival promoter.

13 So what the record evidence  
14 is telling me is that -- is that 1  
15 through 15, for example, are more  
16 valuable than 75 through 90. The record  
17 evidence doesn't necessarily tell me how  
18 to give those fighters more weight. So  
19 what I decided to do for one  
20 specification was to weight a fighter  
21 based on his or her inverse rank.

22 Q. All right. So when you say  
23 headliners, you mean number -- those  
24 ranked 1 through 15, correct?

1           A.       I've defined headliners very  
2       precisely as 1 through 15. I think the  
3       term headliners can connote other --  
4       other numbers.

5           Q.       And in the example that I've  
6       given of the number 1 fighter and the  
7       number 10 fighter, those would both be  
8       headliners within your definition?

9           A.       Correct.

10          Q.       And the number 1 fighter  
11       would be worth ten times as much as the  
12       number 10 fighter, that's correct?

13          A.       Under the --

14          Q.       We're only talking about the  
15       inverse rank weighting.

16          A.       Good.

17          Q.       I'm correct that under the  
18       inverse rank weighting, the number 1  
19       fighter would be weighted ten times as  
20       much as the number 10 fighter; is that  
21       right?

22          A.       Correct.

23          Q.       And there's nothing in the  
24       record that would support that relative

1 revenues, variations in pay-per-view  
2 revenues can be explained by -- by who is  
3 being offered, the rank of the -- of the  
4 fighter that's being offered for that  
5 particular event.

6 Q. The -- you mentioned the  
7 subject before, but let me go over it.

8 Now, in calculating the  
9 foreclosure share, you used two  
10 alternative definitions. One was all  
11 Zuffa fighters compared to total MMA  
12 fighters weighted by revenue, and the  
13 other was -- I'm sorry. Actually, I  
14 think I got that right.

15 So in calculating  
16 foreclosure share, you used two  
17 alternative definitions. One was all  
18 Zuffa fighters compared to total MMA  
19 fighters, and the other you only included  
20 fighters whose contracts contained a  
21 champions clause and had a 30-month or  
22 longer period of exclusivity.

23 Do I have that right?

24 A. I think that's fair.

1 Q. Okay. And how did you  
2 decide that the 30-month threshold was  
3 appropriate?

4 A. Primarily two ways. If you  
5 go to my report, there might be others,  
6 but the first was I'm familiar with --  
7 with various case law that speaks to what  
8 constitutes a contract of sufficient  
9 duration to be considered exclusionary.

10 And second basis was that  
11 I -- I looked at the average and medium  
12 duration of a fighter and I -- I wanted  
13 to make sure that -- that the number that  
14 I went with as the cutoff represented a  
15 sizable or significant or material share  
16 of the -- from an economic perspective of  
17 the fighter's average career span.

18 Q. I should have asked you this  
19 before. When we were looking at Figure  
20 1, market share and 2 -- and Figure 3,  
21 which is foreclosure share, foreclosure  
22 share is the result of your regression?

23 A. No.

24 Q. Is that right?

1                   A.       No.    So foreclosure share  
2       would be an input to the regression,  
3       right?   And so you can do one pass, which  
4       I did, which is to presume that all  
5       fighters working under -- under a Zuffa  
6       contract will foreclose.   That's one  
7       approach.   And in that case, foreclosure  
8       share just equals Zuffa's market share.  
9       And so whenever a fight or event pair  
10      shows up in the regression database,  
11      you'll see a measure of foreclosure  
12      share, which is just equal to the market  
13      share.

14                   Under a second approach, you  
15      can -- you can allow the foreclosure  
16      share to deviate from the market share by  
17      insisting that not only does the fighter  
18      work for Zuffa, but the fighter also  
19      fights pursuant to a contract that  
20      contains a championship clause, is  
21      exclusive and runs longer than -- equal  
22      to or longer than 30 months.

23                   Q.       All right.   So for some of  
24      your models you used a foreclosure share

1 morning for purposes of damages.

2 A. Yes.

3 Q. I'm going to return to that  
4 topic.

5 In those benchmarks, you are  
6 using two competitors of -- of Zuffa  
7 comparing the percentage of their  
8 revenues paid to labor or paid to the  
9 fighters to that of Zuffa. I think we've  
10 established that, correct?

11 A. Correct.

12 Q. Okay. Why in economic  
13 theory would you use the percentage of  
14 revenue paid to labor by a competitor as  
15 a benchmark?

16 A. Because this is a voluntary  
17 transaction between a willing buyer and a  
18 willing seller as to the appropriate wage  
19 in the -- in the MMA industry. And so I  
20 think if we're looking for -- for  
21 reasonable comparables that exist within  
22 the same relevant market, this is the  
23 logical place to start looking.

24 Q. When you use the term



1 appropriate wage.

2 A. Yes.

3 Q. Are the Bellator -- is  
4 Bellator paying the fighters higher  
5 average wages than the UFC?

6 A. I'd say it depends on which  
7 fighter you're talking about, but --

8 Q. I said average.

9 A. Yeah, the weight -- sorry.

10 MR. CRAMER: I was going to  
11 say you mean today, Bellator?

12 MR. ISAACSON: At any time.

13 THE WITNESS: The -- the  
14 levels of a Bellator or a  
15 Strikeforce fighter on average  
16 would tend to be below the levels  
17 of the UFC fighters.

18 BY MR. ISAACSON:

19 Q. So why, in economic theory,  
20 would you use the percentage of revenues  
21 that a competitor allocates to the labor  
22 as a benchmark as opposed to the -- the  
23 actual appropriate wage that they decided  
24 to pay?

1           A.       Here's why: The record  
2       evidence tells us that Zuffa had its eye  
3       on the wage share, not the absolute wage,  
4       they had its eyes on the wage share.  
5       They were committed to pushing the wage  
6       share at or below 20 percent. This is  
7       how the industry works, this is how they  
8       think.

9                   Now, imagine a but-for world  
10      in which you strip out the exclusionary  
11      contracts and Strikeforce and Bellator  
12      and others are able to evolve into  
13      legitimate and viable contenders for this  
14      market, what would likely happen is that  
15      their output would expand, their revenues  
16      would expand and now their 60 percent  
17      offerings, or in the case of Bellator  
18      their 48 percent offerings, would start  
19      to draw fighters away from UFC and  
20      towards those rivals.

21                  And now the question is what  
22      does Zuffa have to do in this -- in this  
23      but-for world? Is Zuffa able to stay on  
24      its 18 percent share when were all of its

1 is part of your analysis of what makes a  
2 contract 30 months or longer?

3 A. No. No, there are few --  
4 the retirement clause and some other  
5 tolling provisions were not counted in --  
6 when I went to add up the durations. In  
7 that sense, my -- my method is  
8 conservative.

9 Q. All right. The -- so the  
10 retirement clause or another tolling  
11 provisions of the contracts, in the  
12 absence of contracts that were 30 months  
13 or longer, you don't have an opinion  
14 about whether they're anticompetitive,  
15 correct?

16 A. On a stand-alone basis, no.  
17 And you keep -- you keep  
18 saying, just so the record is clear, in  
19 the absence of 30 months. Remember it's  
20 exclusive plus duration.

21 Q. Right. Understood.

22 A. Okay.

23 Q. The -- the exclusive  
24 negotiation clause, is that a provision

1       that you have taken into account in  
2       calculating the 30 months or more?

3               A.       Yes.

4               Q.       Am I correct that -- if my  
5       colleague will allow me a compound  
6       question to save time -- that items that  
7       you have discussed include preventing the  
8       use of fighter clips when you move to a  
9       new promotion, moving sponsors with you  
10      when you move to a new promotion, and  
11      warning fighters not to sign over their  
12      likenesses to other promoters, those  
13      would -- you would not have an opinion  
14      about whether those actions were  
15      anticompetitive in the absence of  
16      exclusive contracts that were 30 or more  
17      months?

18              A.       I think that's fair.

19              Q.       Okay. And do you have an  
20      opinion about whether exclusivity  
21      provisions with venues, sponsors or  
22      broadcasters are anticompetitive in the  
23      absence of exclusive contracts of 30 or  
24      more months?

1                   A.       I don't have an opinion.

2                   Q.       Okay. Do you, together with  
3       contracts, inclusive contracts that are  
4       30 or more months, do the -- is it your  
5       opinion that the exclusivity provisions  
6       with venues increase the foreclosure  
7       share of Zuffa?

8                   MR. CRAMER: Objection to  
9       form.

10                  THE WITNESS: I think that  
11       in conjunction with the primary  
12       restrictions on fighter mobility,  
13       the exclusives on the venues can  
14       be -- can be considered to be  
15       anticompetitive.

16                  Whether they contributed to  
17       higher foreclosure shares, I'd --  
18       I'd have think about it. I  
19       imagine one might construct a  
20       story, but I'd have to -- I'd have  
21       to think about it some more.

22       BY MR. ISAACSON:

23                  Q.       Okay. Today you don't have  
24       an opinion about whether exclusivity

1 provisions with venues, even taken  
2 together with exclusivity agreements with  
3 fighters of 30 or more months, would  
4 increase the foreclosure share --  
5 increase the foreclosure share?

6 A. Like I said, I can imagine  
7 how they could funnel more fighters into  
8 this net and therefore trigger the  
9 mechanism that's causing the rate  
10 suppression in my -- in my models, but I  
11 don't really have an opinion beyond that.

12 Q. In general, we'll save time  
13 if you tell me whether you have opinions  
14 as opposed to what you imagine.

15 A. Okay.

16 Q. Or could imagine. I don't  
17 mean that as a criticism, I mean that as  
18 constructive.

19 MR. CRAMER: Constructive  
20 criticism.

21 MR. ISAACSON: No, not even  
22 that. A constructive way to get  
23 through the day.

24 MR. CRAMER: Advice.

1 contract -- 30-month exclusive contracts,  
2 that would drop to near zero?

3 A. Correct.

4 Q. And --

5 A. And so now if you asked me  
6 that at point how to do an allocation  
7 among --

8 Q. No, I'm not --

9 A. -- counter-programming, da,  
10 da, da, we'd be allocating a pot of zero.

11 Q. Let me ask -- let me ask  
12 questions here. Okay?

13 The -- in 2011, both those  
14 numbers rise to about 90 percent. Do you  
15 see that? The blue and purple lines?

16 A. Yes.

17 Q. Okay. And without the  
18 exclusive 30-year contracts, the  
19 90 percent would drop to almost zero  
20 percent?

21 A. Correct.

22 Q. Okay. The rise from 2007 to  
23 2011 from 40 -- 30 to 40 percent to  
24 90 percent?

1 A. Uh-huh, yes.

2 Q. Right? Are you able to tell  
3 me how much of that was due to exclusive  
4 contracts of 30 or more months as opposed  
5 to those contracts in combination with  
6 other things such as counter-programming?

7 MR. CRAMER:

8 Incomprehensible, form.

9 THE WITNESS: I just don't  
10 understand how you do a  
11 decomposition like that when  
12 there's only one necessary  
13 element. If the necessary element  
14 goes, the foreclosure drops to  
15 zero, and the notion of allocating  
16 zero across the other elements is  
17 a fool's errand.

18 BY MR. ISAACSON:

19 Q. Right. So if it's a  
20 necessary element to 40 percent or  
21 90 percent, does that tell you why it  
22 rose from 40 to 90 percent?

23 A. No.

24 MR. CRAMER: When it's a



1                   good time to break, we've been  
2                   going for about an hour.

3                   MR. ISAACSON:   Sure.   Well,  
4                   actually, let me -- unless you're  
5                   dying.

6                   MR. CRAMER:   No, no, go  
7                   ahead.

8       BY MR. ISAACSON:

9                   Q.       There are allegations in  
10                  this case of the use of identity rights  
11                  of the plaintiffs such as things on Fight  
12                  Pass or on posters or on television  
13                  episodes.   You're aware of those?

14                  A.       Yes.

15                  Q.       Okay.   Are those  
16                  anticompetitive acts, in your opinion,  
17                  that contribute to the foreclosure  
18                  effect?

19                  A.       The way that I'd prefer to  
20                  put it is that when -- when done in  
21                  conjunction with what I consider to be  
22                  the one necessary element, they're  
23                  anticompetitive, they're exacerbating  
24                  things, and I don't have an opinion on

1           A.       I prefer direct evidence  
2       generally, and I think that I've -- I  
3       offer a slew of evidence that speaks to  
4       how you can prove directly that Zuffa  
5       exercises monopsony power.

6           Q.       I understand that you  
7       offered direct and indirect evidence, but  
8       I need to ask about them one at a time  
9       and we can cover both.

10          A.       Okay.

11          Q.       So in terms of when you  
12       define a market, can you describe to me a  
13       situation where if you use revenue  
14       weighting in the input market, where  
15       the -- a monopoly firm would not  
16       necessarily have a monopoly in the input  
17       market?

18                   MR. CRAMER:   Incomplete  
19       hypothetical, form.

20                   THE WITNESS:   I've never  
21       given thought to that, and I'd  
22       like to think about it and maybe  
23       we'll come back.   But I don't  
24       think I'm prepared to -- to

1           construct a scenario about how  
2           that could occur.

3       BY MR. ISAACSON:

4           Q.       All right. The -- and then  
5       you've described geographic market for  
6       the output market also. And is that also  
7       North America?

8           A.       Yes.

9           Q.       All right. The -- and in  
10      terms of your SSNIP analysis -- all  
11      right. So did you do -- well, my  
12      colleague wants to know so it seems like  
13      a good question.

14      A.       I'm sure it is.

15      Q.       In the out -- in the output  
16      market, what is being sold? In the  
17      output markets that you have defined.

18      A.       Sure. I think that you  
19      are -- the production or the product that  
20      is being produced are -- is live MMA  
21      events and the revenue associated with  
22      those events can take the form of gate  
23      revenue or pay-per-view. That's from --  
24      from the consumer side. Of course,

1       there's -- there's revenues from the  
2       advertiser's side as well.

3                       But I hope that answers your  
4       question.

5                       Q.       All right. And does  
6       pay-per-view compete with broadcast?

7                       MR. CRAMER: Objection to  
8       form.

9                       THE WITNESS: I did not  
10       conduct that inquiry.

11       BY MR. ISAACSON:

12                      Q.       Do you have an opinion one  
13       way or another about that?

14                      A.       No.

15                      Q.       All right. With respect to  
16       the -- does -- do the live venue events  
17       compete with pay-per-view events?

18                      A.       I don't even understand the  
19       question. Many of the pay-per-view  
20       events are live.

21                      Q.       Meaning I watch it on  
22       pay-per-view as opposed to go see it  
23       live.

24                      A.       I haven't -- I haven't

1 studied that and I imagine for someone  
2 who lives very far from the venue where  
3 the live event is staged, they would not  
4 be considered reasonably close  
5 substitutes.

6 Q. So for your input markets,  
7 what evidence did you take into account  
8 to assess customer's likely response to  
9 price increase in the SSNIP analysis?  
10 And feel free to point me to the sections  
11 of your report that --

12 A. Did you mean to say -- I  
13 think you just conflated the input  
14 markets and customers. Maybe we should  
15 start over.

16 Q. Yes, I said price increase  
17 rather than wage decrease, but let me  
18 just put it this way: What evidence in  
19 your report did you take into account to  
20 assess the likely response to a SSNIP in  
21 the input markets?

22 A. Sure. So there it's the  
23 perspective of the fighters not the  
24 customers. So I was tripping up over

1       your --

2                   Q.       Yes.

3                   A.       -- injecting customers when  
4       we're talking about input markets.

5                   So I can take you to the  
6       relevant sections, and I will, but of  
7       course at high levels, I'm looking at  
8       record evidence of -- of what fighters  
9       and promoters thought about substitution  
10      possibilities as you -- if you were to  
11      move away from Zuffa to counteract a  
12      hypothetical wage cut.

13                  Q.       Okay. So the first thing  
14      you looked at was record evidence of  
15      substitution.

16                  A.       Or the perception of  
17      substitution from the stakeholders, the  
18      fighters, the promoters, and I'll just  
19      point you, if you --

20                  Q.       That's -- that's sufficient  
21      for -- for item 1.

22                           MR. CRAMER: You asked him  
23                           to look at his report.

24                           MR. ISAACSON: I'm going

CERTIFICATE

I HEREBY CERTIFY that the witness was duly sworn by me and that the deposition is a true record of the testimony given by the witness.

It was requested before completion of the deposition that the witness, HAL J. SINGER, Ph.D., have the opportunity to read and sign the deposition transcript.

*Constance S. Kent*



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Constance S. Kent, CCR, RPR, CLR  
Certified Court Reporter  
Registered Professional Reporter  
Certified LiveNote Reporter  
and Notary Public in and for the  
Commonwealth of Pennsylvania  
Dated: October 1, 2017

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